ENTRY	NUMBER	ROUTING DESTINATION
A	908 979 XXXX	STATION NUMBER
B	908 852 XXXX	CENTRAL OFFICE 852
C	908 XXX XXXX	908 TANDEM SWITCH
D	XXX XXX XXXX	LONG DISTANCE POINT-OF-PRESENCE

FIG. 1
PRIOR ART

ENTRY	NUMBER	NUMBER	ROUTING DESTINATION
A	908 XXX XXXX		EXAMINE LIST THAT FOLLOWS
A.a		908 979 XXXX	STATION NUMBER
A.b		908 852 XXXX	CENTRAL OFFICE 852
A. c		908 XXX XXXX	908 TANDEM SWITCH
B	XXX XXX XXXX		LONG DISTANCE POINT-OF-PRESENCE

FIG. 2

ENTRY	NUMBER	LEVEL	ROUTING DESTINATION
A	908 979 XXXX	3	STATION NUMBER
B	908 852 XXXX	3	CENTRAL OFFICE 852
C	908 XXX XXXX	2	908 TANDEM SWITCH
D	XXX XXX XXXX	1	LONG DISTANCE POINT-OF-PRESENCE

FIG. 3

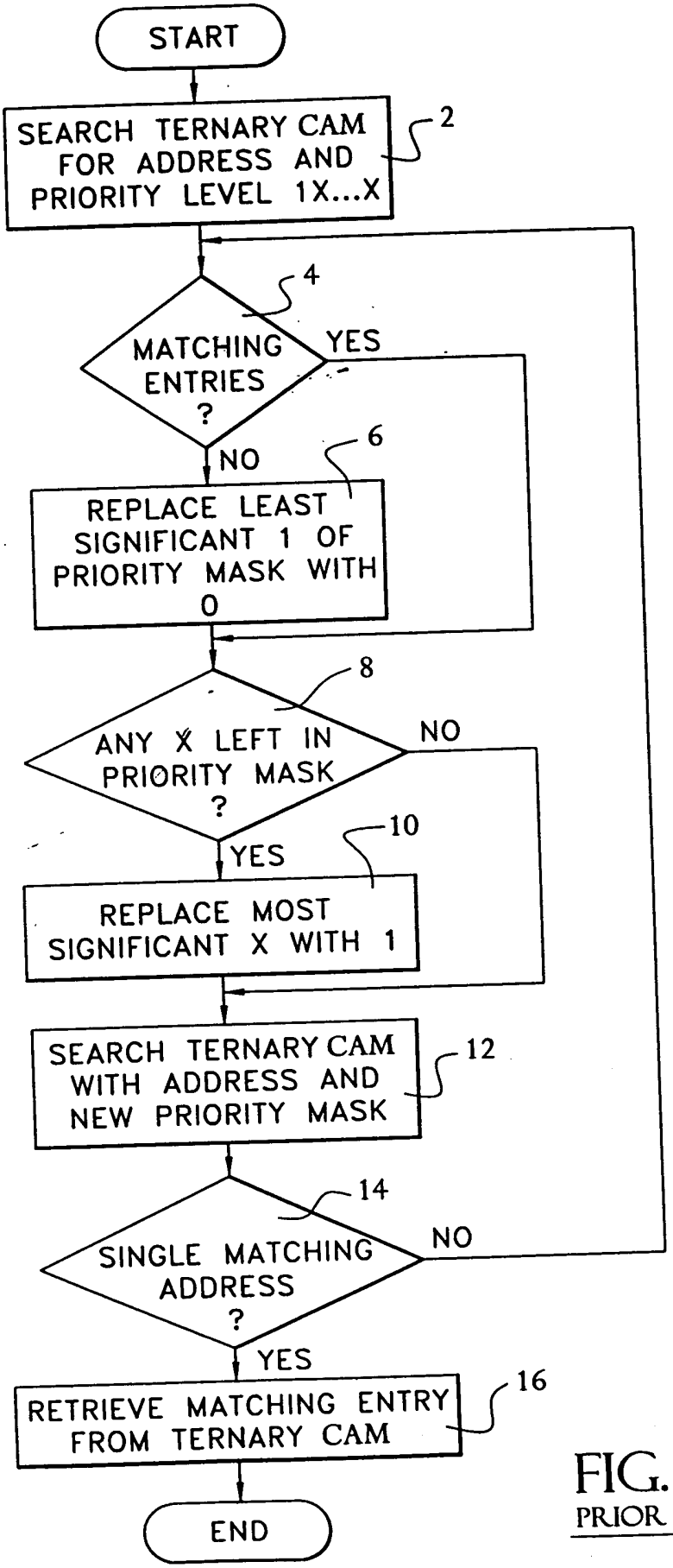

FIG. 4
PRIOR ART

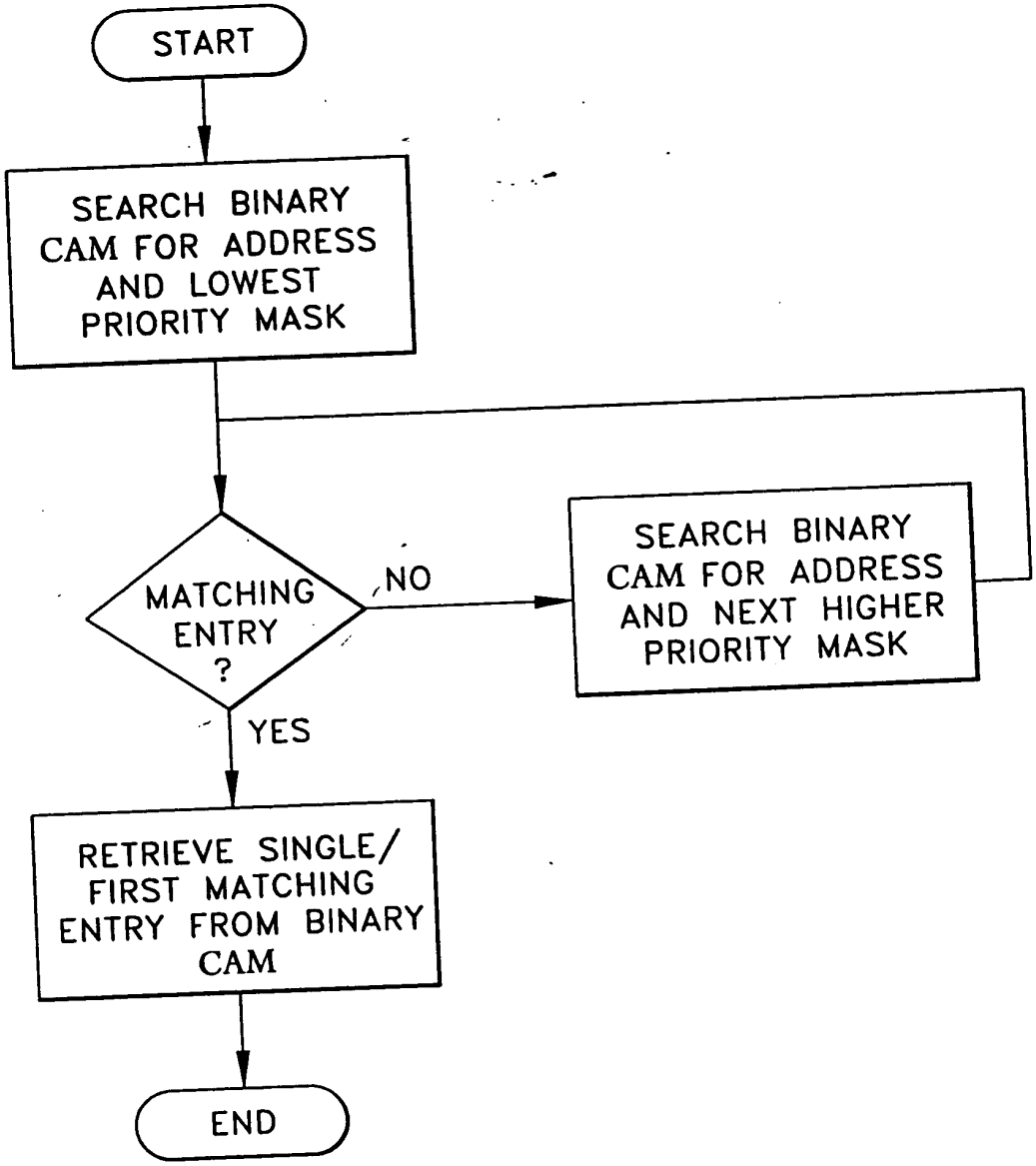

FIG. 5
PRIOR ART

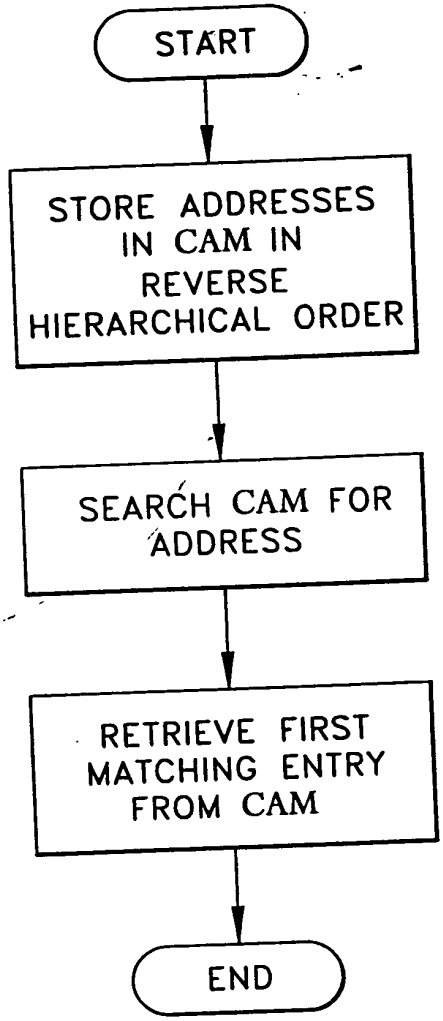

FIG. 6
PRIOR ART

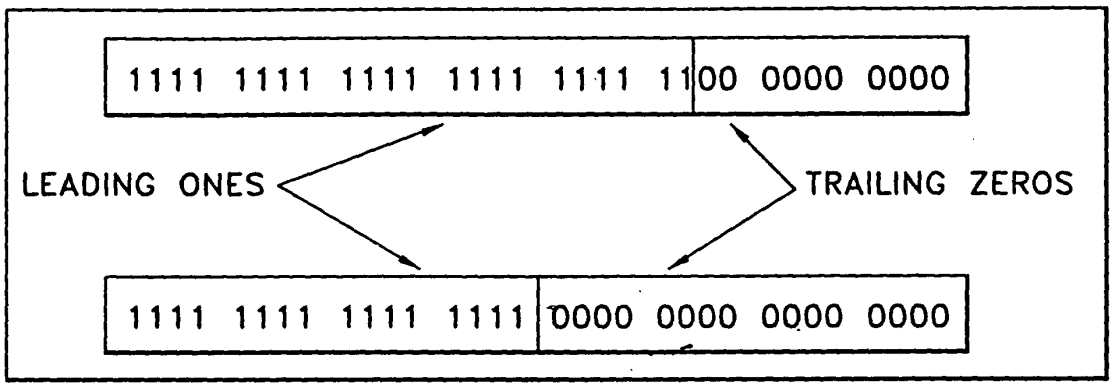

FIG. 7

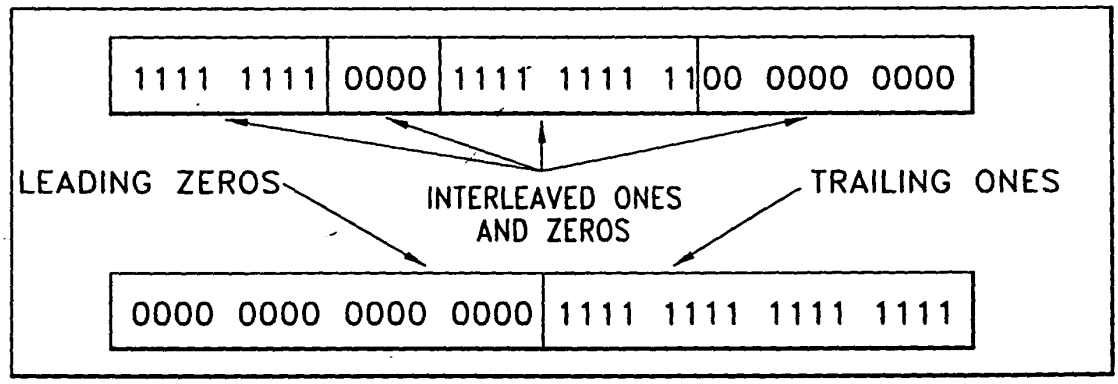

FIG. 8

ADDRESS	MASK
C0.18.0C.15	FF.FF.FF.FF/32
C0.18.0C.10	FF.FF.FF.F0/28
C0.18.0C.00	FF.FF.FC.00/22
C0.18.00.00	FF.FF.00.00/16

FIG. 9

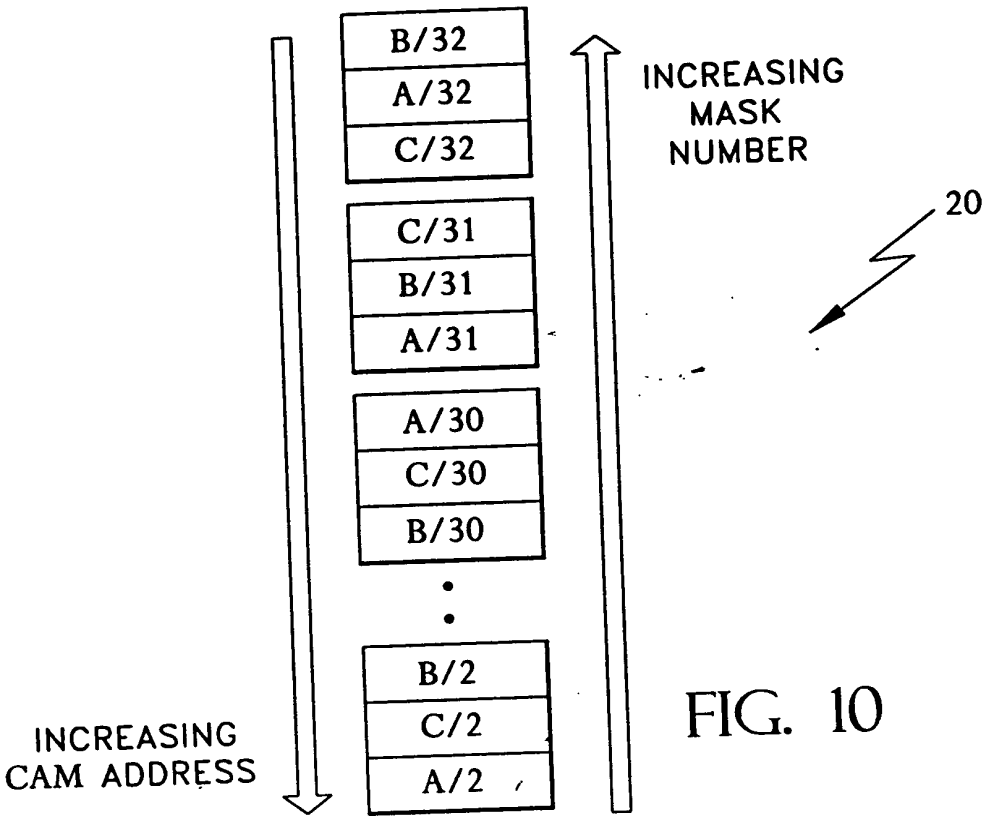
B/32
A/32
C/32
C/31
B/31
A/31
A/30
C/30
B/30
B/2
C/2
A/2
INCREASING MASK NUMBER
20
INCREASING CAM ADDRESS

FIG. 10

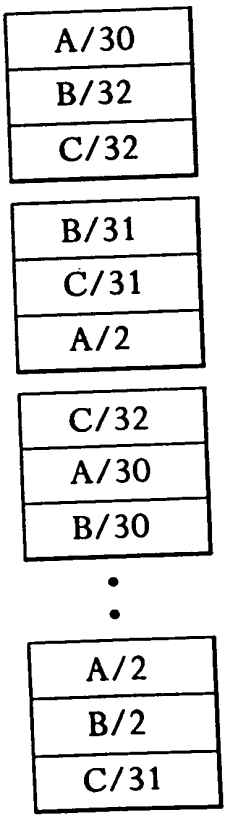
A/30
B/32
C/32
B/31
C/31
A/2
C/32
A/30
B/30
A/2
B/2
C/31

FIG. 11

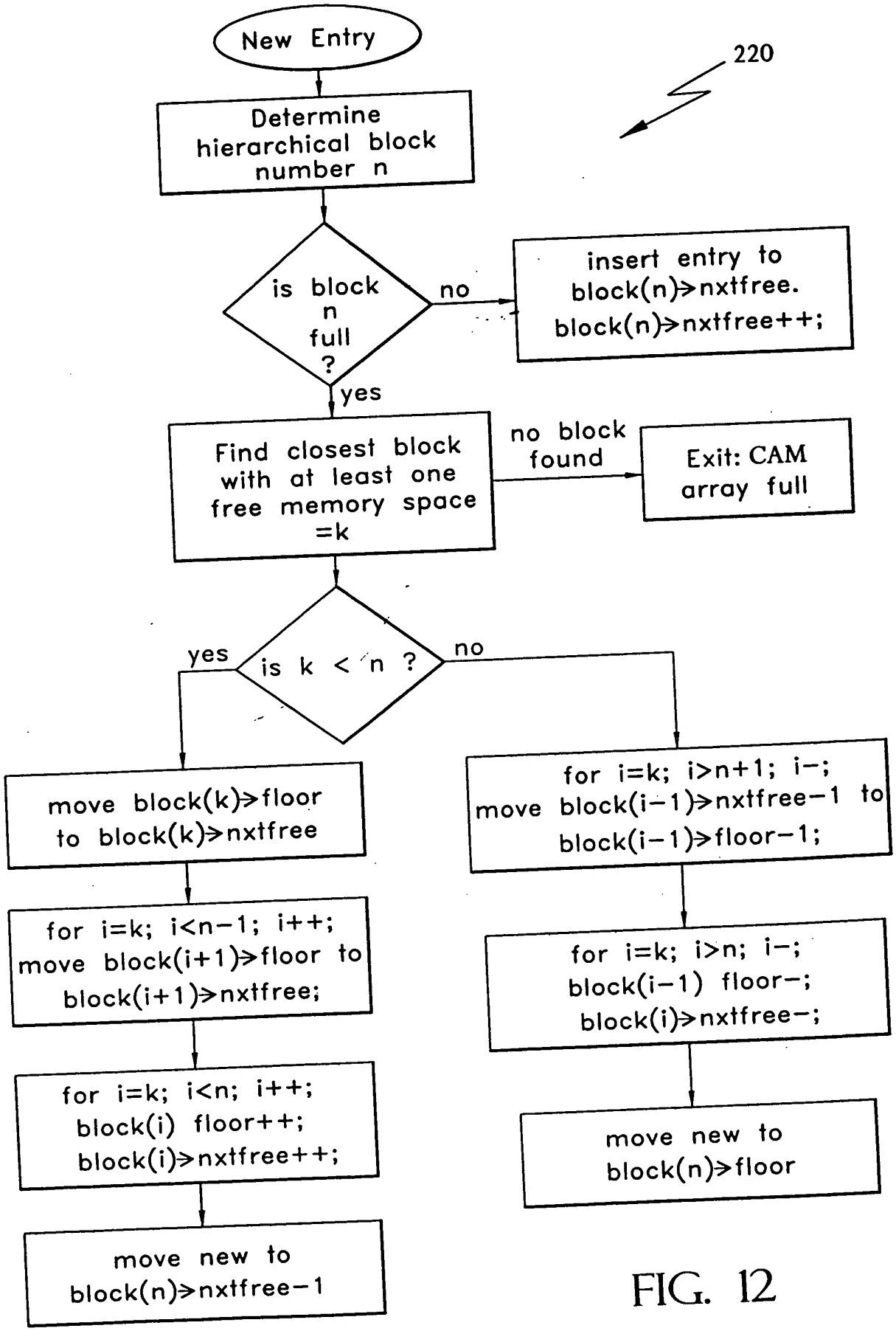
New Entry
220
Determine hierarchical block number n
is block n full ?
no
insert entry to block(n)⇒nxtfree.
block(n)⇒nxtfree++;
yes
Find closest block with at least one free memory space =k
no block found
Exit: CAM array full
yes
is k < n ?
no
move block(k)⇒floor to block(k)⇒nxtfree
for i=k; i<n−1; i++;
move block(i+1)⇒floor to block(i+1)⇒nxtfree;
for i=k; i<n; i++;
block(i) floor++;
block(i)⇒nxtfree++;
move new to block(n)⇒nxtfree−1
for i=k; i>n+1; i−;
move block(i−1)⇒nxtfree−1 to block(i−1)⇒floor−1;
for i=k; i>n; i−;
block(i−1) floor−;
block(i)⇒nxtfree−;
move new to block(n)⇒floor

FIG. 12

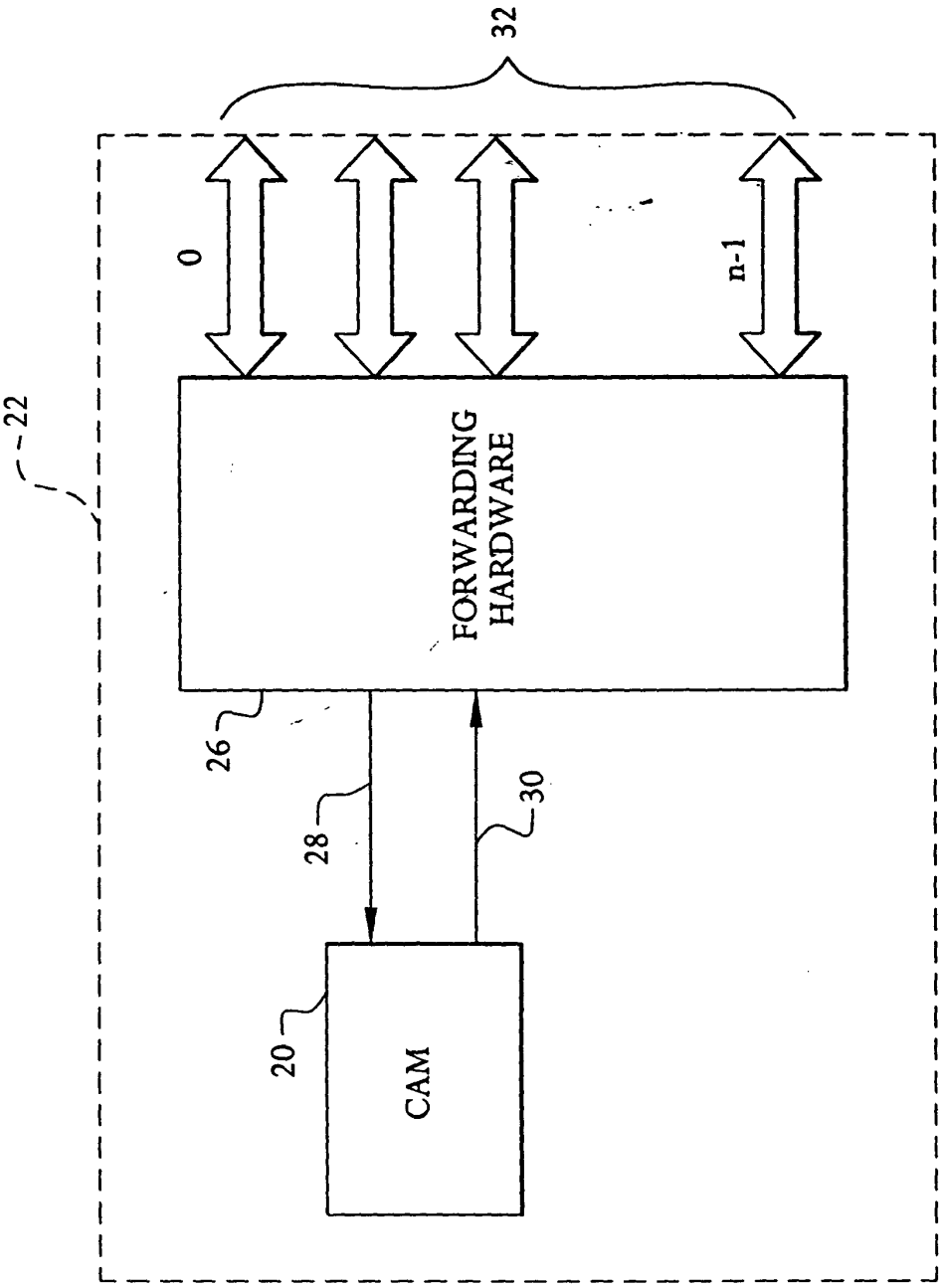

FIG. 13

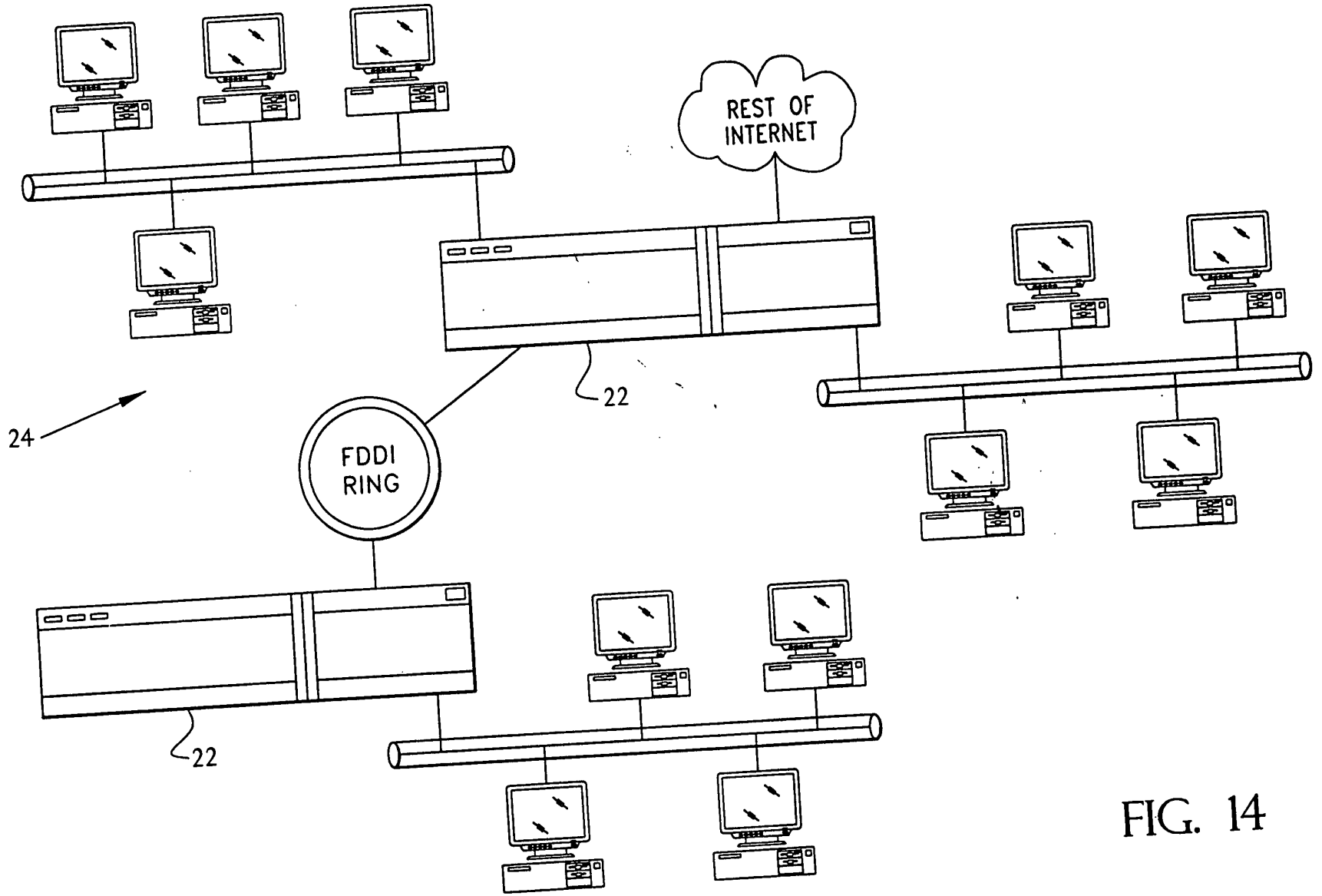

FIG. 14

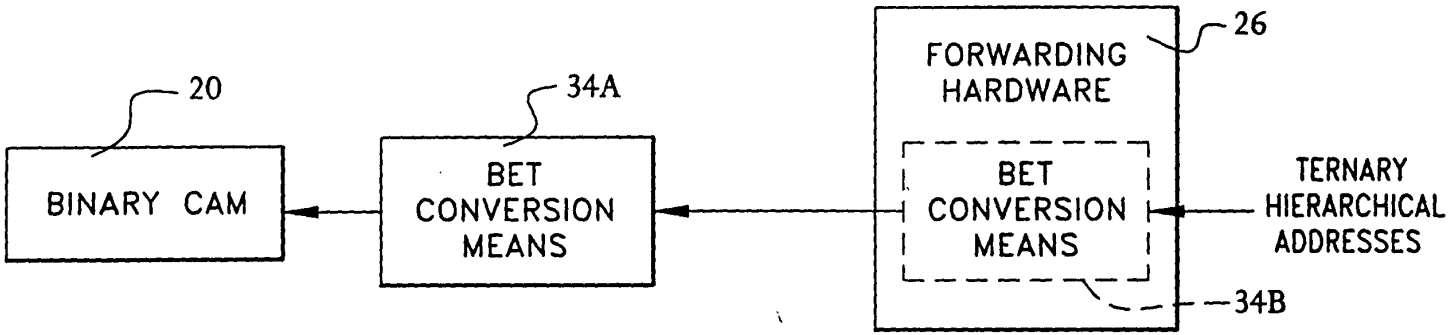

FIG. 15

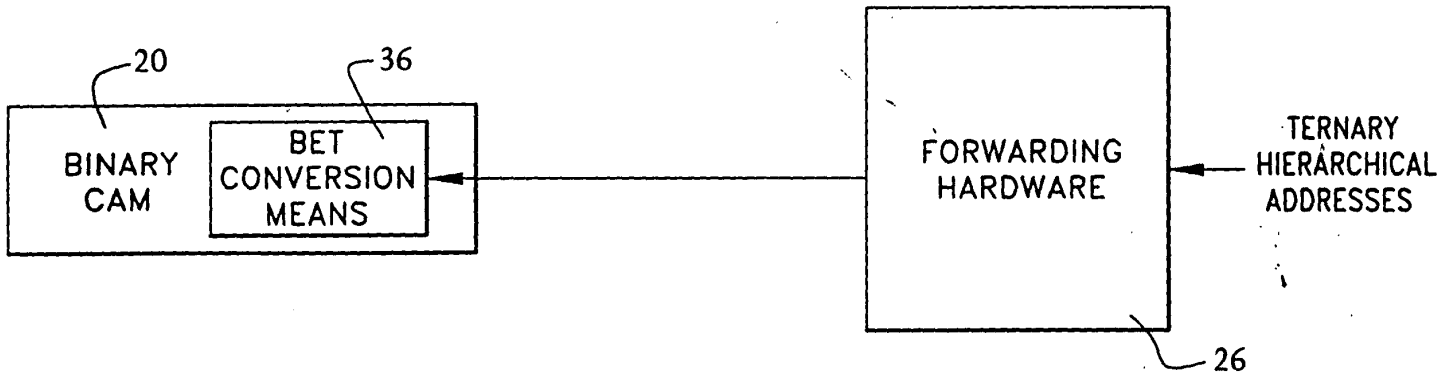

FIG. 16

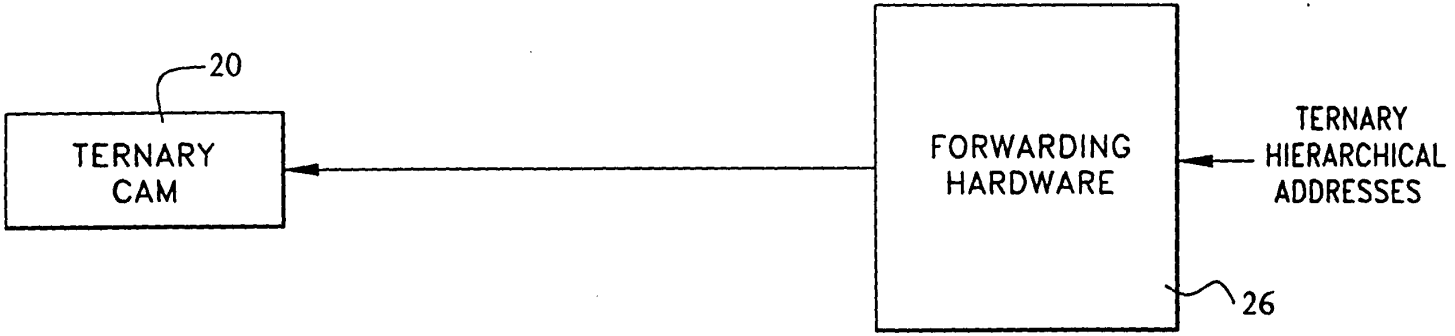

FIG. 17

63 32	31 0
ADDR AND MASK	(!ADDR) AND MASK
CO.18.OC.15	3F.E7.F3.EA

FIG. 18

TERNARY	BINARY ENCODED
0	01
1	10
X	00

FIG. 19

38	COMPARAND BITS	10(1)	10(1)	10(1)
40	MASK BITS	10	10	10
	CAM BITS	00(X)	01(0)	10(1)
	RESULT	MATCH	NO-MATCH	MATCH

FIG. 20

COMPARAND BIT	0	1	0	1	0	1	0	1
MASK BIT	0	0	1	1	0	0	1	1
CAM BIT	0	0	0	0	1	1	1	1
RESULT	MATCH	NO-MATCH	MATCH	MATCH	NO-MATCH	MATCH	MATCH	MATCH

FIG. 21

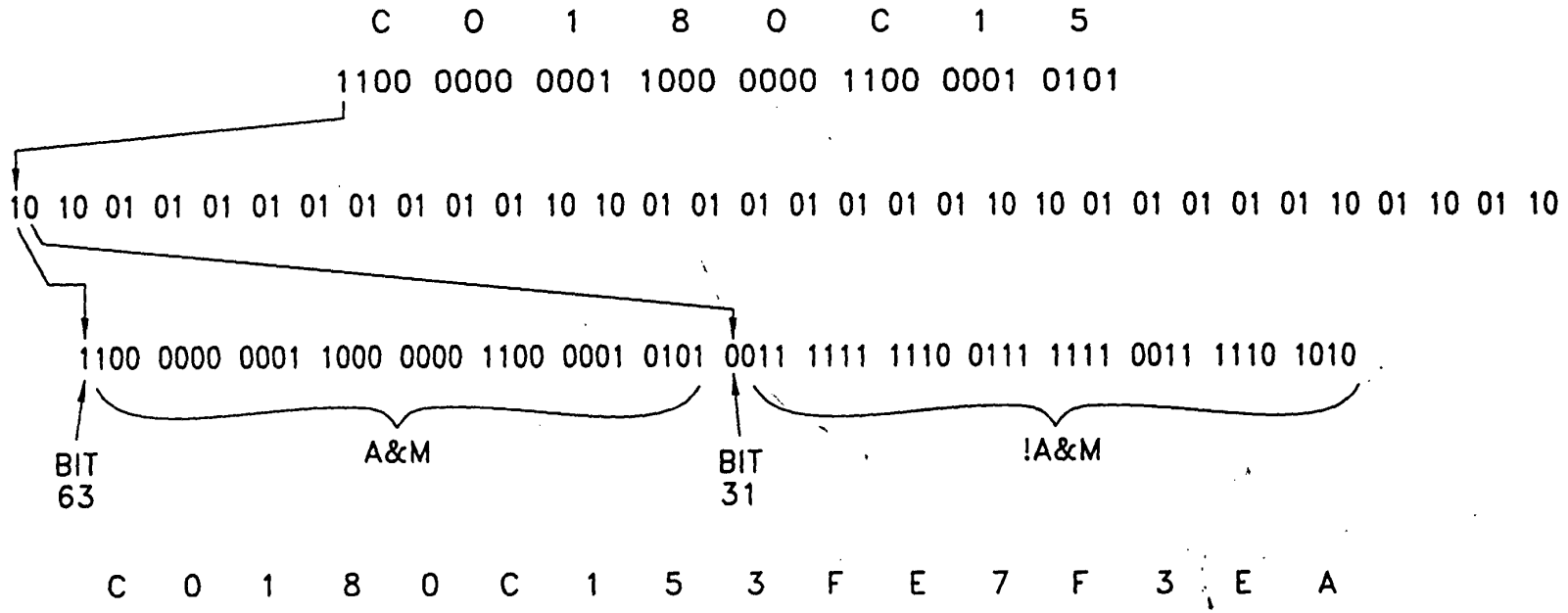

FIG. 22

1100 0000 0001 1000 0000 1100 0001 0101	C0180C15
0011 1111 1110 0111 1111 0011 1110 1010	3FE7F3EA

FIG. 23

ENTRY	IP ADDRESS	IP MASK	CAM BITS [63:32]	CAM BITS [31:0]
1	CO.18.OC.15	FF.FF.FF.FF	CO.18.OC.15	3F.E7.F3.EA
2	CO.18.OC.10	FF.FF.FF.FO	CO.18.OC.10	3F.E7.F3.EO
3	CO.18.OC.OO	FF.FF.FC.OO	CO.18.OC.OO	3F.E7.FO.OO
4	CO.18.OO.OO	FF.FF.OO.OO	CO.18.OO.OO	3F.E7.OO.OO

FIG. 24

COMPARAND REGISTER	1100	0000	0001	1000	0000	1100	0001	0101	0011	1111	1110	0111	1111	0011	1110	1001
MASK REGISTER	1100	0000	0001	1000	0000	1100	0001	0101	0011	1111	1110	0111	1111	0011	1110	1001
CAM ENTRY	1100	0000	0001	1000	0000	1100	0000	0000	0011	1111	1110	0111	1111	0000	0000	0000
RESULT	xxyy	yyyy	yyyx	xyyy	yyyy	xxyy	yyyx	yxyx	yyxx	xxxx	xxxy	yxxx	xxxx	yyxx	xxxy	xyyx

NOTES:
1. x = THE RESULT WAS A "DON'T CARE" MATCH.
2. y = THE RESULT WAS A NORMAL BINARY MATCH.

FIG. 25

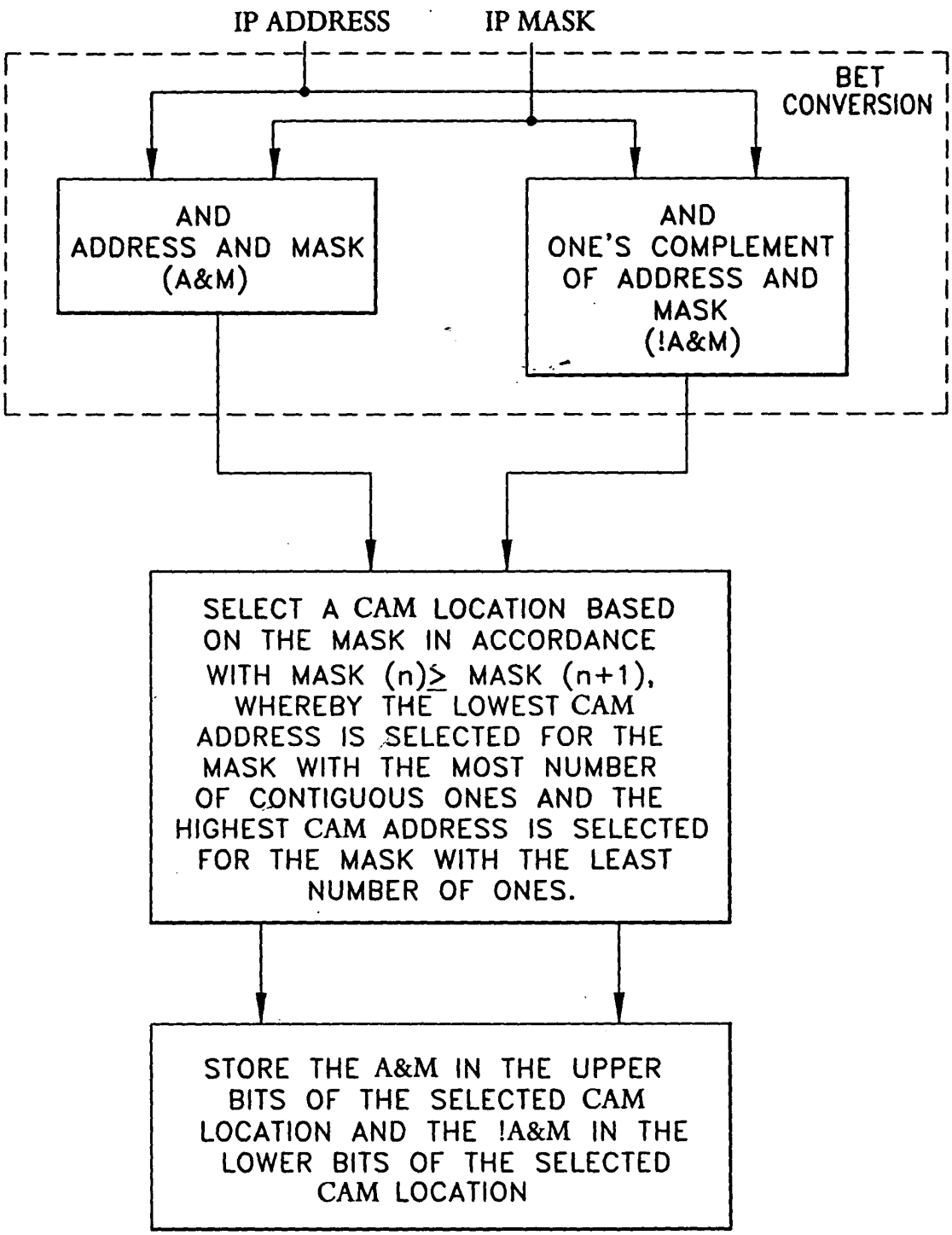
IP ADDRESS
IP MASK
BET CONVERSION
AND ADDRESS AND MASK (A&M)
AND ONE'S COMPLEMENT OF ADDRESS AND MASK (!A&M)
SELECT A CAM LOCATION BASED ON THE MASK IN ACCORDANCE WITH MASK (n)≥ MASK (n+1), WHEREBY THE LOWEST CAM ADDRESS IS SELECTED FOR THE MASK WITH THE MOST NUMBER OF CONTIGUOUS ONES AND THE HIGHEST CAM ADDRESS IS SELECTED FOR THE MASK WITH THE LEAST NUMBER OF ONES.
STORE THE A&M IN THE UPPER BITS OF THE SELECTED CAM LOCATION AND THE !A&M IN THE LOWER BITS OF THE SELECTED CAM LOCATION

FIG. 26

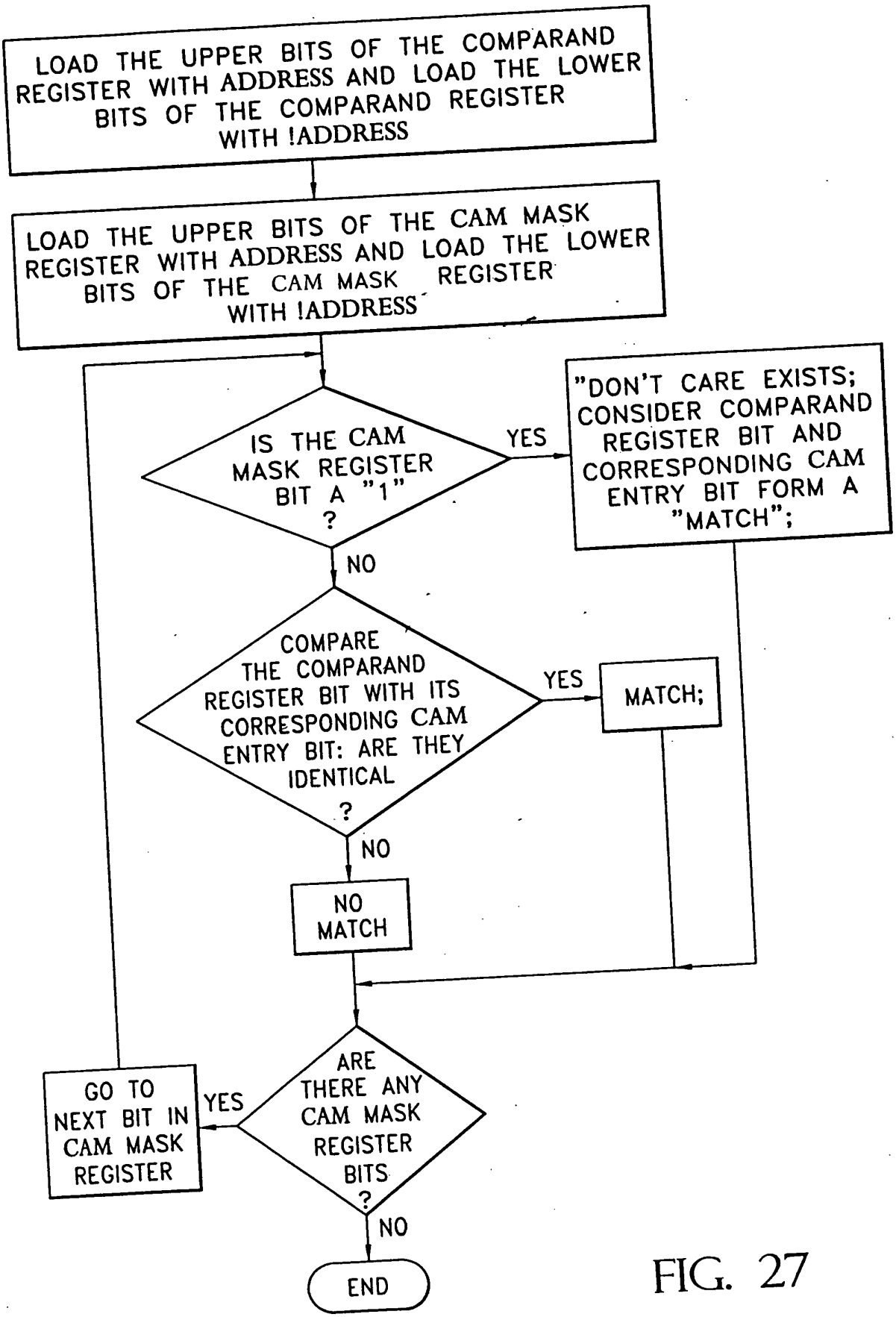
LOAD THE UPPER BITS OF THE COMPARAND REGISTER WITH ADDRESS AND LOAD THE LOWER BITS OF THE COMPARAND REGISTER WITH !ADDRESS
LOAD THE UPPER BITS OF THE CAM MASK REGISTER WITH ADDRESS AND LOAD THE LOWER BITS OF THE CAM MASK REGISTER WITH !ADDRESS
IS THE CAM MASK REGISTER BIT A "1" ?
YES
"DON'T CARE EXISTS; CONSIDER COMPARAND REGISTER BIT AND CORRESPONDING CAM ENTRY BIT FORM A "MATCH";
NO
COMPARE THE COMPARAND REGISTER BIT WITH ITS CORRESPONDING CAM ENTRY BIT: ARE THEY IDENTICAL ?
YES
MATCH;
NO
NO MATCH
ARE THERE ANY CAM MASK REGISTER BITS ?
YES
GO TO NEXT BIT IN CAM MASK REGISTER
NO
END

FIG. 27

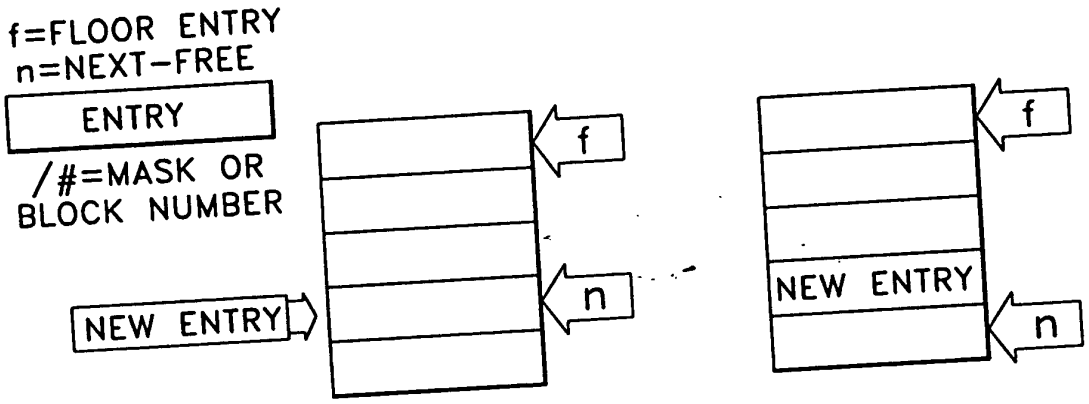

FIG. 28

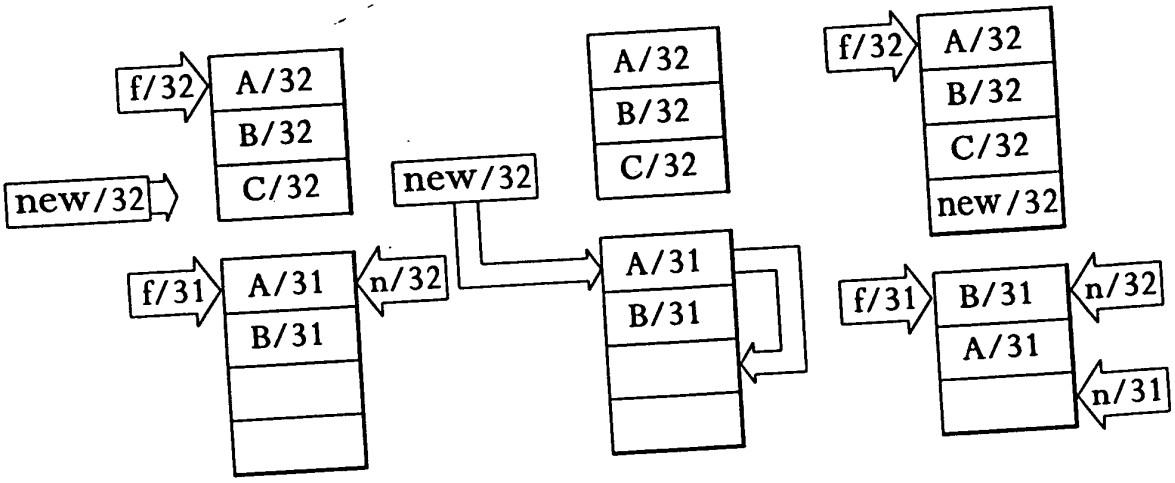

FIG. 29a FIG. 29b FIG. 29c

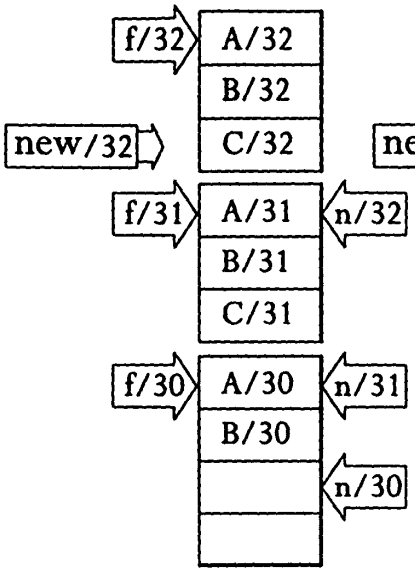

FIG. 30a

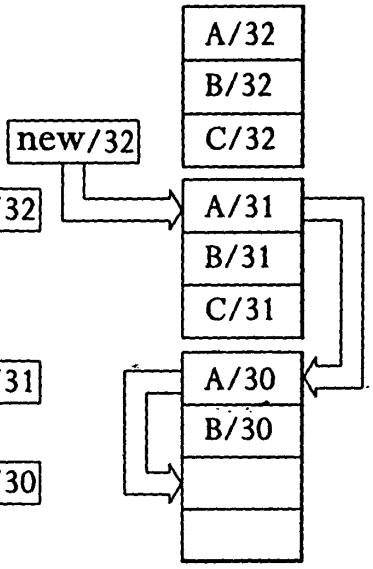

FIG. 30b

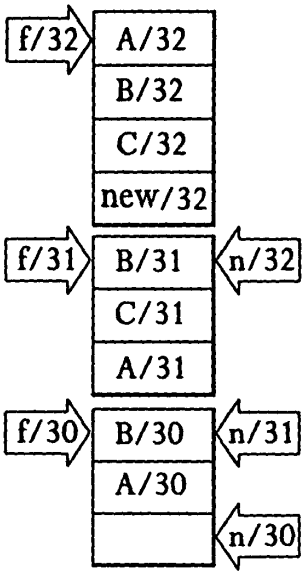

FIG. 30c

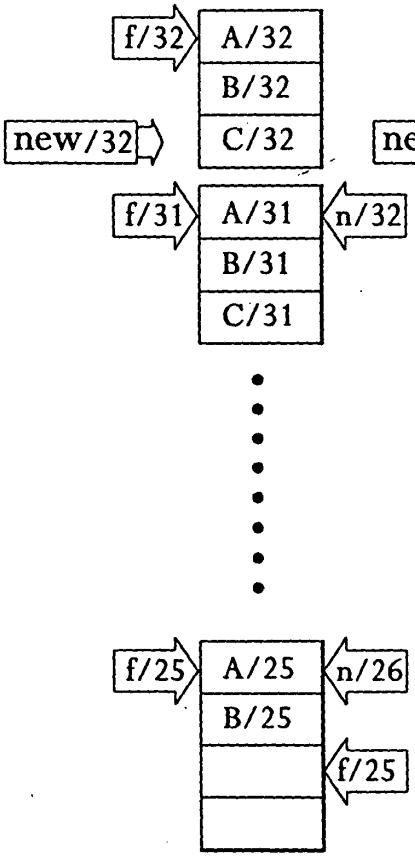

FIG. 31a

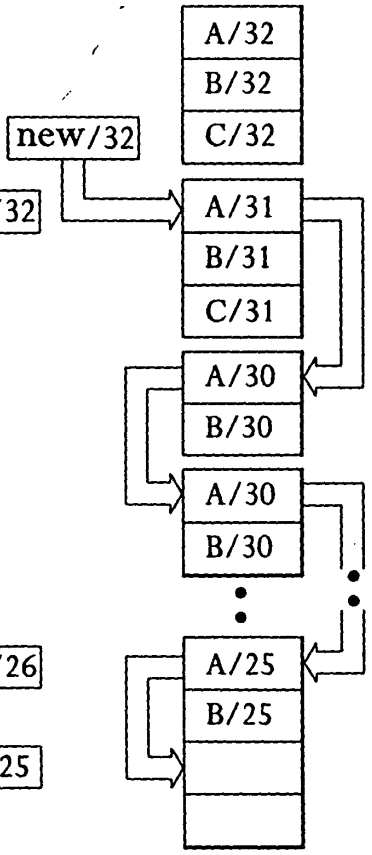

FIG. 31b

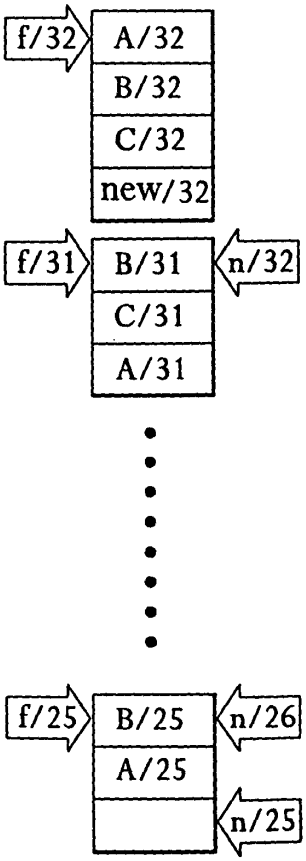

FIG. 31c

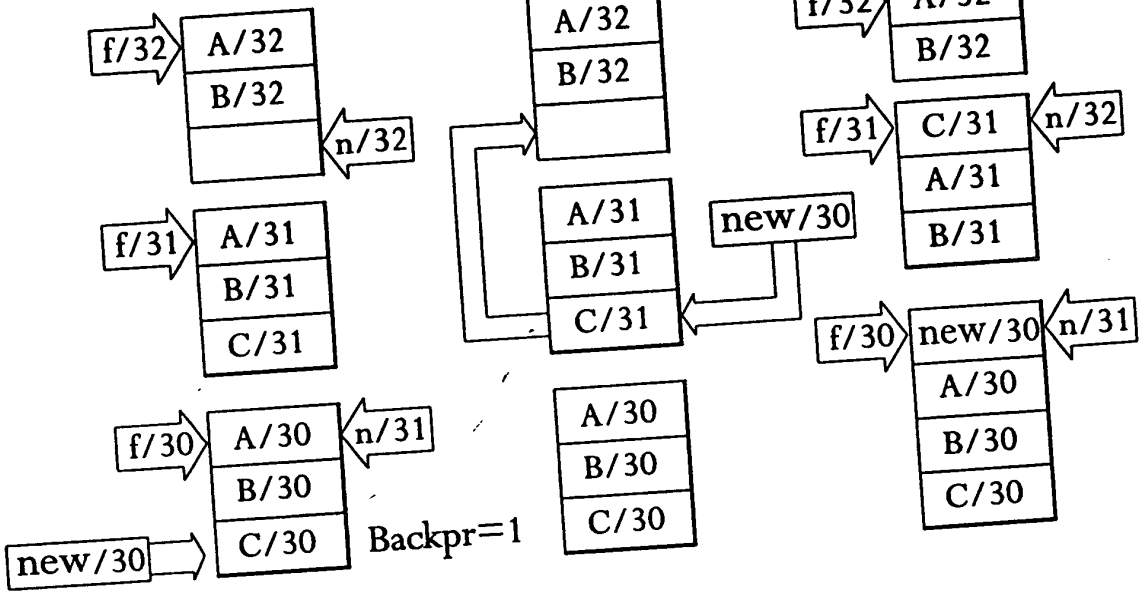

FIG. 32a FIG. 32b FIG. 32c

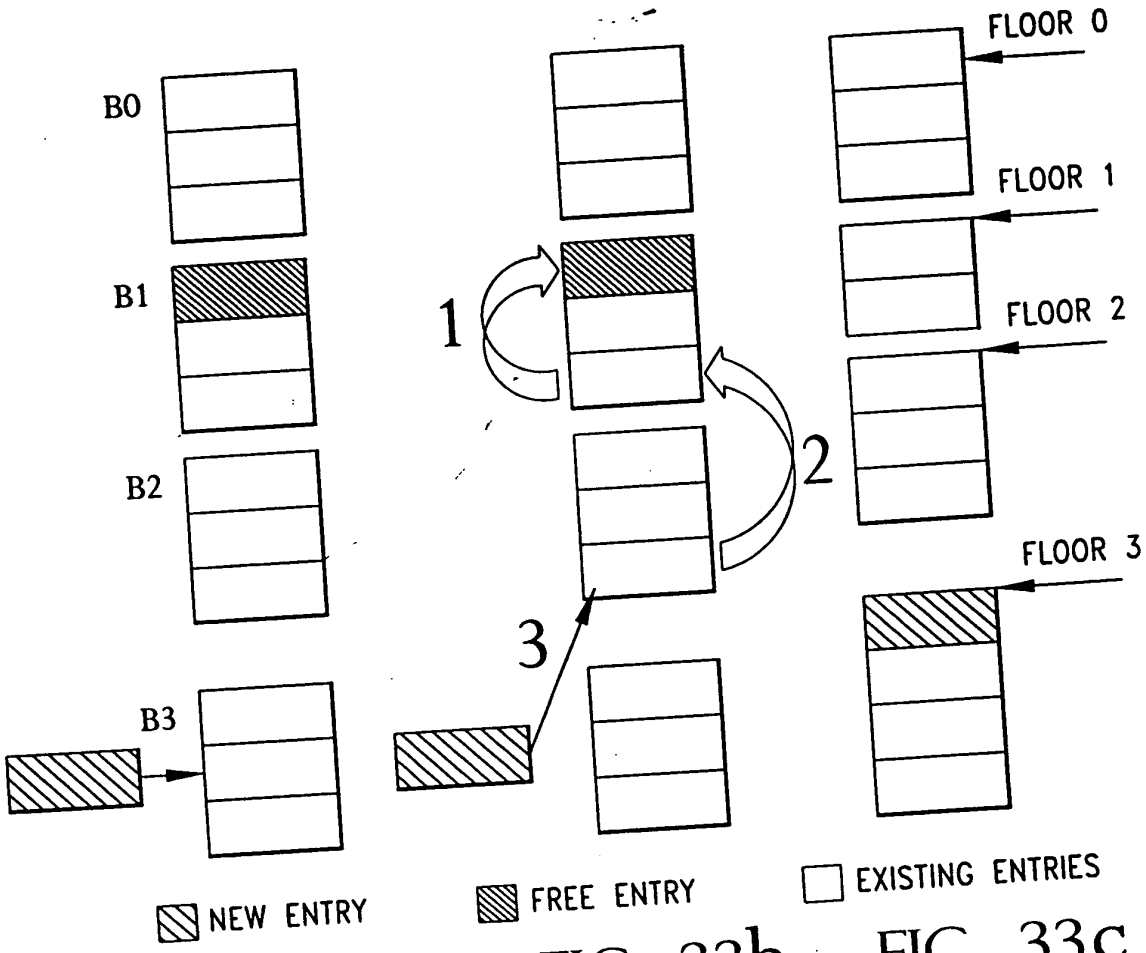

FIG. 33a FIG. 33b FIG. 33c

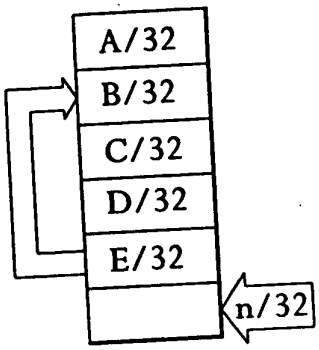

FIG. 34a

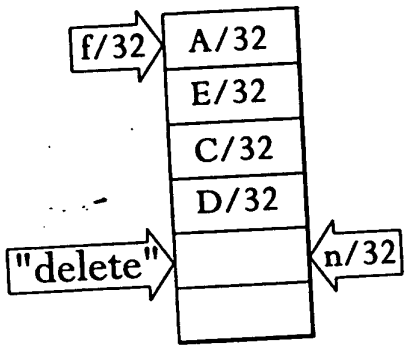

FIG. 34b

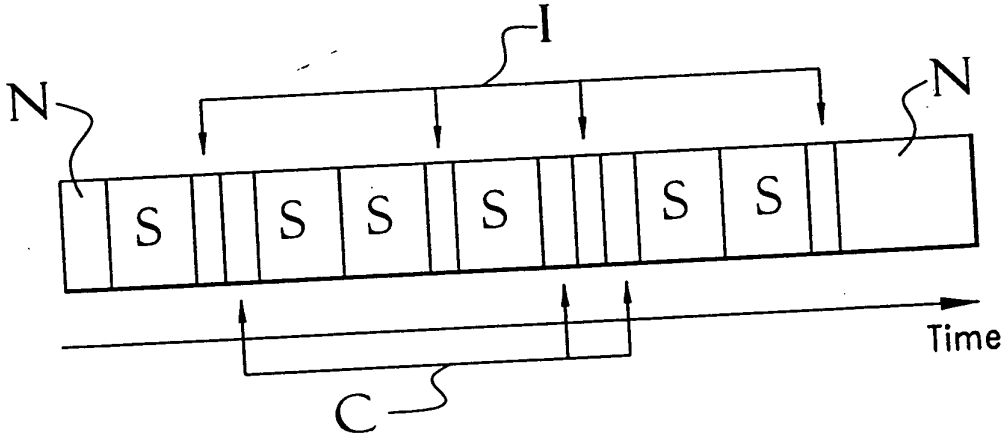

FIG. 35